3M™ Multi-Touch Chassis Display User Guide

Model C3266PW

Read and understand all safety information contained in this document before using this product.

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Contents

Introduction

Overview 6
Important Safety Information 7
Important Notes 9
Service and Repair Indicators 9
Touch Sensor Care and Cleaning 10
3M Touch Systems Support Services 10
Contact 3M Touch Systems 11

Chapter 1 Setting Up Your Multi-Touch Chassis Display

System Requirements 12
Unpacking Your Touch Display 12
Connecting the Touch Display 14
Multimedia Features 14
Testing the Multi-Touch Chassis Display 14
Mounting the Multi-Touch Chassis Display 15
Articulating Arm Mounting Option 15
Access to the Video Controls 16
Clearance and Ventilation 16
Video Card Requirements 16
Using the Standard Controls for the Video Card 16
Supported Video Display Modes and Refresh Rates 17
Configuring the Display Settings 17
Adjusting the Multi-Touch Chassis Video Display 17
On Screen Display 18
Menu Navigation 18
Picture Menu 19
Color Menu 20
Screen/Display Menu 22
OSD Menu 24

Setup Menu 26

Chapter 2 Enabling Your Multi-Touch Chassis Display
Windows® 7 USB Compatibility....28
All Other Platforms 28
Multi-Touch Application Support....28
Installing 3M™ MicroTouch™ Software 28
Video Alignment 29

Appendix A 3M™ PX USB Controller Communications
Overview of USB Firmware Communications 31
Communication Basics....31
Receiving Reports from the Controller 32
Command Set 32
Set Feature - Calibration....32
Get Feature - GetStatus 34
Get Feature - GetMaxCount....35
Set Feature - Reset....36
Set Feature –Restore Defaults 36
Asynchronous Reports 37

Appendix B 3M™ PX Serial Controller Communications
Overview of Firmware Commands 39
Controller Default Settings....39
Communicating with the Controller....41
Firmware Commands 43
Calibrate 44
Get Copyright....46
Mode Down Up....46
Mode Inactive....46
Mode Stream 46
Name Command....46
Null Command 46
Output Identity 47
Restore Defaults 47
Soft Reset 48
Unit Type....48

Appendix C Troubleshooting & Maintenance
Display Installation Problems 50
Troubleshooting the Touch Sensor....51
Power Management....52

Appendix D Regulatory Information

Regulatory Agency Approvals 53
FCC Warning 54
CE Conformity for Europe 54

Introduction

Overview

Congratulations on the purchase of your 3M™ Touch Systems Multi-Touch Chassis Display. This guide describes how to set up your 3M™ Multi-Touch Chassis Display.

The 3M Touch Systems product line of chassis displays deliver true multi-touch functionality in a versatile form factor. Perfect for interactive digital signage, interactive tables and kiosk solutions, the 3M Multi-Touch Chassis provides system architects with a high performance, easy to integrate professional display to enable innovative multi-touch solutions.

The combination of 3M's Projected Capacitive Technology (3M PCT) delivering fast, accurate and precise multi-touch response, with a top-of-the-line full high definition LED display, creates an immersive user experience for your next generation interactive applications.

The design of the projected capacitive sensor has more than 6,000 touch sensing points in close proximity, making it precise and extremely accurate across the entire touch screen. The 3M PCT's durable chemically strengthened glass surface has unique anti-stiction properties that greatly reduces surface friction and allows users' fingers to glide effortlessly across the display for easy gesture functions.

Important Safety Information

Read and understand all safety information before using this product. Follow all instructions marked on the product and described in this document. Pay close attention to the following installation warnings and safety precautions.

Intended Use

The 3M Touch Systems Multi-Touch Chassis Display was designed for touch input and tested to replace an existing display. These displays are intended for indoor use only and are not designed for use in hazardous locations.

Explanation of Signal Word Consequences

⚠ **DANGER:** Indicates a potentially hazardous situation, which, if not avoided, will result in death or serious injury and/or property damage.

⚠ **WARNING:** Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury and/or property damage.

⚠ **CAUTION:** Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury and/or property damage.

NOTICE: Indicates a potentially hazardous situation, which, if not avoided, may result in property damage.

⚠ DANGER

To avoid the risk of fire and/or explosion which will result in serious injury or death:

- Do not install or use this product in a hazardous location.

⚠ WARNING

To avoid the risk of electric shock which could result in serious injury or death:

- Do not remove the cover or back of the display. The power supply AC line should be avoided.
- Plug power cord into appropriate grounded power source.
- Do not use a power cord that is frayed or otherwise damaged.
- Do not service the display yourself. There are no user serviceable parts inside. Refer all servicing to qualified service personnel. Any change or modification to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.
- Do not use a damaged display.
- Do not use non-conforming replacement parts.
- Do not place wet or damp objects on the display.

⚠ WARNING

To avoid the risk of electric shock which could result in serious injury or death:

- Do not expose the display to rain or other sources of water, steam, or moisture.
- Do not place foreign objects on the display or its cables.
- Do not remove the cover or back of the display.
- Ensure that connecting the unit to the power source will not overload the power source.

⚠ CAUTION

To avoid the risk of glass breakage which may result in minor or moderate injury:

- To avoid risk of injury when handling the display be aware that the sensor edges may be sharp.
- Handle the display with care to avoid breaking the touch sensor. The display contains glass parts. Dropping the display may cause the glass parts to break.
- Ensure mounting screws are tightened fully to prevent instability.
- Do not place foreign objects on the display.
- Do not use a visibly damaged or broken sensor.
- Ensure that mounting the unit will not adversely affect the stability of the end equipment when installing in free standing equipment or using the VESA mount.

To avoid the potentially hazardous situations associated with the use of alcohol or other solvents which may result in minor or moderate injury or property damage:

- Follow all instructions and recommendations in the manufacturer's Material Safety Data Sheet and product label.
- Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents
- It is important to avoid using any caustic chemicals on the touch sensor.

To avoid possible environmental contamination which may result in minor or moderate injury:

- Dispose of the flat panel display according to applicable governmental regulations.

NOTICE

To avoid the risk of potential damage to the display electronics:

- Always use the VESA 200 mm mounting holes when using an arm attachment. Do not drill additional holes in the unit to mount plates other locations
- Do not use longer screws as they could potentially damage electronics inside the display.

Important Notes

- In extreme temperature and humidity situations, you may observe condensation between the sensor and the display. To minimize this condition, place the unit where it will be used and allow a 24-hour environmental stabilization period prior to powering on the display. Any noticeable condensation is temporary and will have no long term affect on the operation of the display.
- You are cautioned that any change or modification to the equipment not expressly approved by the party responsible for compliance could void your warranty.
- When unplugging the power supply cord, hold the plug, do not pull by the cord.
- Do not connect or disconnect this product during an electrical storm.
- Remember to take into account that the operating temperature of the installation may be greater than the room ambient, and consideration should be given to installing the unit in an environment compatible with the maximum rated operating temperature. Specifications can be found in the product data sheet on the 3M Touch Systems website at http://www.3m.com/touch/.
- When installing the unit, ensure that it does not restrict the flow of air to any other equipment within the installation required for safe operation.
- An inherent characteristic of the PCT sensor is a fine grid pattern that may be visible under certain lighting conditions.
- Install the display in a well-ventilated area. Always maintain adequate ventilation to protect the display from overheating and to ensure reliable and continued operation.
- Do not expose this display to direct sunlight or heat. Passive heat may cause damage to the housing and other parts.
- Do not install this display in areas where extreme vibrations may be generated. For example, nearby manufacturing equipment may produce strong vibrations. The vibrations may cause the display to exhibit picture discoloration or poor video quality.
- Ensure the metal enclosure does not contact the touch sensor.
- Be sure to gasket the display to its enclosure properly to prevent damage to the touch sensor. Refer to the PCT Integration Guide (TSD-38123) for more information.
- To avoid ergonomic concerns:
  Do not install the display in a manner or location with awkward accessibility. Extended use may result in muscle, tendon, or fixed posture strains. It is recommended you take periodic breaks from continuous use.

Service and Repair Indicators

Do not attempt to service this unit yourself. Removing the display cover may expose you to dangerous voltages or other risks. Unplug the display from the power outlet and refer servicing to qualified service personnel in the event that:

- Liquid is spilled into the product or the product is exposed to rain or water.
- The product does not operate properly when the operating instructions are followed.
- The product has been dropped or the metal case has been damaged.

- The product exhibits a distinct change in performance, indicating a need for service.
- The power cable or plug is damaged or frayed.

Touch Sensor Care and Cleaning

The touch sensor requires very little maintenance. 3M Touch Systems recommends that you periodically clean the glass touch sensor surface. Be sure to turn off your display before cleaning.

Typically, an isopropyl alcohol and water solution ratio of 50:50 is the best cleaning agent for your touch sensor.

⚠ CAUTION

To avoid the potentially hazardous situations associated with the use of alcohol or other solvents which may result in minor or moderate injury or property damage:

- Follow all instructions and recommendations in the manufacturer's Material Safety Data Sheet and product label.
- Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents
- It is important to avoid using any caustic chemicals on the touch sensor.

Apply the cleaner with a soft, lint-free cloth. Avoid using gritty cloths.

Always dampen the cloth and then clean the sensor. Be sure to spray the cleaning liquid onto the cloth, not the sensor, so that drips do not seep inside the display or stain the bezel.

3M Touch Systems Support Services

3M Touch Systems, Inc. provides extensive support services through our website and technical support organization. Visit the 3M Touch Systems website at http://www.3m.com/touch/, where you can download MT 7 software and drivers, obtain regularly updated technical documentation on 3M Touch Systems products, and learn more about our company.

Whenever you contact Technical Support, please provide the following information:

- Touch display size, part number and serial number
- Current driver version
- Operating system used
- Information on additional peripherals

Technical Support is available Monday through Friday 8:30 a.m. to 5:30 p.m. with limited call back service after 5:30 p.m. until 8:00 p.m. US Eastern Standard Time – 9 a.m. to 5 p.m. throughout Europe.

You can contact 3M Touch Systems, Inc. Technical Support (US only -- Eastern Standard Time) by calling the hot line, sending email or a fax.

Technical Support Hot Line: 978-659-9200
Technical Support Fax: 978-659-9400
Toll Free: 1-866-407-6666 (Option 3)
Email: US-TS-techsupport@mmm.com

Contact 3M Touch Systems

Contact information for all offices can be found on our website at:
http://www.3m.com/touch/

CHAPTER 1

Setting Up Your Multi-Touch Chassis Display

This chapter describes how to set up your 3M Touch Systems Multi-Touch Chassis Display. You need to complete the following tasks:

- Unpack the components
- Connect the video cable, touch display cables, and power cable
- Power on the display and test your setup
- If you are not running Windows® 7 (or Tablet PC), install MT7 software from the enclosed CD.

System Requirements

The Multi-Touch Chassis Display requires a personal computer (PC). The requirements for your PC are as follows:

- Your PC must have an available USB or RS-232 serial communication (COM) port. You connect the touch sensor cable to this communications port.
- Your PC must have a video card and video driver already installed for the display. If you need to install a video card or a video driver, refer to your computer documentation for instructions.

Note: Before setting up your Multi-Touch Chassis Display, refer to the "Important Safety Information" section at the beginning of this document.

Unpacking Your Touch Display

Carefully unpack the carton and inspect the contents. Your Multi-Touch Chassis Display includes the following cables and accessories:

- USB and RS-232 serial communication cables
- DVI, HDMI, and VGA video cables
- US, UK or EU power cables (as needed)
- Hardware Kit -- 4 mounting brackets and (12) 8-32 screws

Cables Included with Your Chassis Multi-Touch Display

USB Cable

9-pin RS-232 serial cable

VGA Cable

DVI Cable

US Power Cable

HDMI Cable

EU power cable (optional)

UK power cable (optional)

Audio Cable

Connecting the Touch Display

Note: You are cautioned that any change or modification to the equipment not expressly approved by the party responsible for compliance could void your warranty.

To connect the Multi-Touch Chassis Display:

1. Turn off your computer. You should always turn off the computer before connecting or disconnecting a device.
2. Select either the DVI or VGA or HDMI cable. Connect one end of the video cable to the video connector on the display. Connect the other end to the video card in your computer.
3. Connect one end of the touch sensor cable (*either* USB or serial) to the LCD. Connect the other end to an available port on your computer.

   Note: Do not connect *both* USB and serial cables to the display. Choose one or the other.
4. Connect the power cable to an appropriate grounded power source.

Multimedia Features

The C3266PW Multi-Touch Display comes with speakers built into the back of the display housing and includes audio cables. These cables can be connected underneath the display.

Testing the Multi-Touch Chassis Display

Note: The Multi-Touch Chassis Display has a power status light and video controls located on the side of the display.

Before testing your touch display, make sure all cables are connected properly. Be sure to tighten all cable screws. After connection, turn on the power switch located on the back of the display.

To test that the display is working properly:

1. Turn on your computer.
2. Make sure the video image is displayed. If it is not, check the LED to ensure that the display is not in power save mode (amber)
3. Make sure the video image is centered within the screen area. Use the display controls to adjust the image, if necessary.

You can adjust the horizontal and vertical position, contrast, and brightness to better suit your video card and your personal preference. For additional details, refer to the Adjusting the Video Display later in this chapter.

Mounting the Multi-Touch Chassis Display

The Multi-Touch Chassis Display is designed to fit any type of enclosure. All 3M Touch Systems chassis displays are encased in rugged metal instead of plastic, making them easy to integrate.

⚠ CAUTION

To avoid the risk of glass breakage which may result in minor or moderate injury:

- To avoid risk of injury when handling the display be aware that the sensor edges may be sharp.

The Multi-Touch Chassis Display includes a hardware accessory kit for mounting the unit into an enclosure. The hardware accessory kit includes 4 mounting brackets and (12) 8-32 screws. The mounting holes are located on all 4 sides of the display. Always use the supplied screws.

Note: Always use the mounting holes when attaching to the brackets. Do not drill additional holes in the unit to mount brackets to other locations.

To remove the bezel, simply remove the screws along the edge.

Once you remove the bezel, you can attach the brackets to the edges of the chassis. The brackets are slotted, allowing the chassis to slide in and out. You can also rotate the brackets to various positions.

Note: Given the variety of factors that can affect the use and performance of any product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the specific gasket to determine whether it is suitable for a particular purpose and suitable for the user's intended application.

Articulating Arm Mounting Option

The unit has a 200 mm VESA mounting pattern on the back to allow for arm mount capability. Use 3/8 inch (9mm) screws to secure the VESA mount stand for use only with UL listed wall mount bracket with minimum weight load capability of 33 lbs (15 kg). Follow the manufacturer's instructions included with the mounting device to properly attach your display.

NOTICE

To avoid the risk of potential damage to the display electronics:

- Always use the VESA 200 mm mounting holes when using an arm attachment. Do not drill additional holes in the unit to mount plates other locations
- Do not use longer screws as they could potentially damage electronics inside the display.

Access to the Video Controls

The Multi-Touch Chassis Display has seven buttons for using the on-screen menu and adjusting the video display. These controls are located on the side of the Multi-Touch Chassis Display. These buttons let you display the on-screen menu and adjust the phase, image position, contrast, and brightness. Make sure you will be able to access the video controls once the Multi-Touch Chassis Display is installed.

Clearance and Ventilation

Leave at least two inches of clearance space behind the Multi-Touch Chassis Display for proper ventilation. Units have vent holes at the top and bottom on the back of the chassis -- ensure these holes are not blocked during installation. Always maintain adequate ventilation to protect the display from overheating and to ensure reliable and continued operation.

Refer to the published specifications for the maximum and minimum operating temperature and humidity conditions. Refer to the product data sheet on the 3M Touch Systems website at http://www.3m.com/touch/.

Video Card Requirements

Before you connect your touch display, make sure our computer has a video card installed that supports the native video resolution of 1920 x 1080 for the Multi-Touch Chassis Display. If you need information on installing a video card or video driver, refer to the manual that came with your video card.

Using the Standard Controls for the Video Card

In addition to the standard controls on the display, each video card has several controls that let you adjust the display settings. The software and driver for each video card is unique. In most cases, you adjust these settings by using a program or utility provided by the manufacturer of the video card.

For example, you can use the Windows Display Properties control panel to adjust the desktop area (resolution), color depth, and refresh rate. Whenever you change these settings, the image size, position, or shape may change. This behavior is normal. You can readjust the image using the display controls described in this chapter.

For more information on adjusting the desktop area/resolution, color depth, or refresh rate, refer to the user manual that came with your video card. If you change the resolution, it is a good idea to calibrate your sensor.

Supported Video Display Modes and Refresh Rates

Your video card should support one of the display modes specified below. If you select an unsupported video mode, the display may stop working or display unsatisfactory picture quality.

Display Mode	Refresh Rate (Hz)
640 x 480	60
800 x 600	60
1024 x 768	60
1152 x 864	70
1280 x 720	60
1280 x 768	60
1280 x 960	60
1280 x 1024	60
1360 x 768	60
1600 x 1200	60
1680 x 1050	60
1920 x 1080	60

Configuring the Display Settings

After you connect your Multi-Touch Chassis Display and turn on your computer, you may need to configure one or more of these display settings. The ideal setting for the Multi-Touch Chassis Display is as follows:

Display mode (also called desktop area or video native resolution) 1920 x 1080

Refresh rate (also called vertical scan rate or vertical sync) 60 Hz

Color depth (also called color palette or number of colors) at least 16-bit (high color)

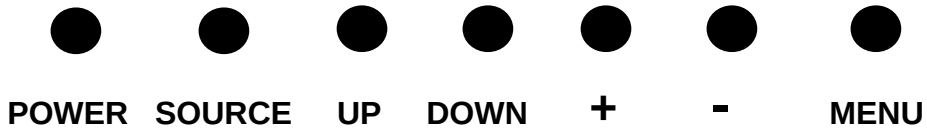
Adjusting the Multi-Touch Chassis Video Display

This section provides guidelines for adjusting the video display and using the display controls to adjust the image to your liking. The controls for adjusting the video display are located on the back of the Multi-Touch Chassis Display. These buttons let you display the on-screen menu and adjust the phase, image position, contrast, and brightness. Before you make any adjustments:

- Be sure to adjust the controls in your normal lighting conditions.
- Display a test image or pattern whenever you adjust the video.

On Screen Display

Your Multi-Touch Chassis Display has five controls for adjusting the video display.



Your Multi-Touch Chassis Display has seven controls to adjust the video display.

- **Power** -- Turns the display on and off.
- **Source** -- Selects the applicable input source either VGA, HDMI, or DVI. Settings are saved automatically.
- **Up** -- Press to move among the menus and from the menu selection to specific choices. (HOT KEY: Auto Configure)
- **Down** -- Press to move among the menus and from the menu selection to specific choices. (HOT KEY: Adjust Aspect Ratio)
- **+ (plus sign)** – (HOT KEY) Press to Mute or Un-mute sounds. Also to increase the volume.
- **- (minus sign)** -- Press to decrease the volume.
- **Menu** -- Shows or hides the onscreen display menu and acts as the Select key when scrolling through menu options. Refer to Menu Navigation below for additional information.

If you do not press any buttons, the display adjustment program times out (you can adjust this time -- up to 12 seconds) and hides the menu options. You can press the Menu button at any time to display the options again.

Pressing Menu will pull up the On Screen Display (OSD) menus to control the Picture, Color, Display, OSD Settings, and Setup, as shown below.

Menu Navigation

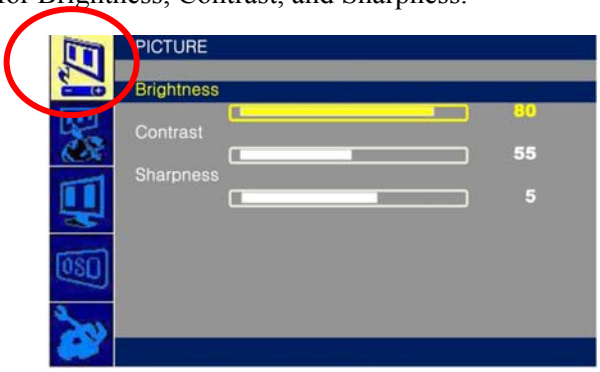
To adjust the On-Screen Display:

1. Select the Menu button to bring up the on-screen display (OSD)
2. Use the Up and Down buttons to scroll through the various Menu choices:
   - Picture Menu
   - Color Menu
   - Screen/Display Menu
   - OSD Menu
   - Setup Menu
3. Once the Menu you want is highlighted, hit the Menu button again to select that Menu.

4. Use the Up and Down buttons to scroll through the various Menu options. For example, once you have chosen the Picture Menu, use the Up/Down buttons to select either Brightness, Contrast or Sharpness.
5. Once the option you want is highlighted, hit the Menu button again to select that option.
6. Use the Up and Down buttons to increase or decrease the value of the option.
7. Your selection will be automatically saved.

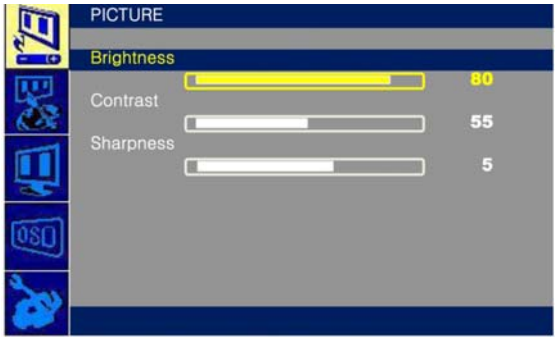
Picture Menu

Includes choices for Brightness, Contrast, and Sharpness.



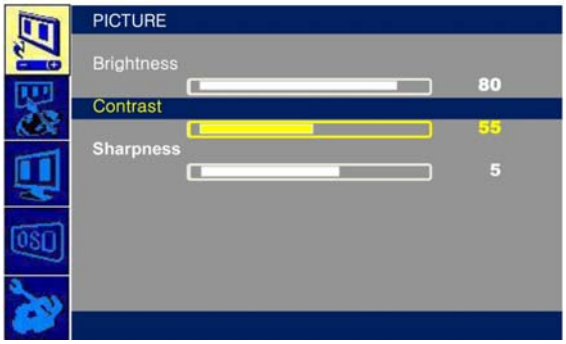
Brightness

Selecting the Brightness option will allow you to adjust the luminescence of the display. Settings are saved automatically.



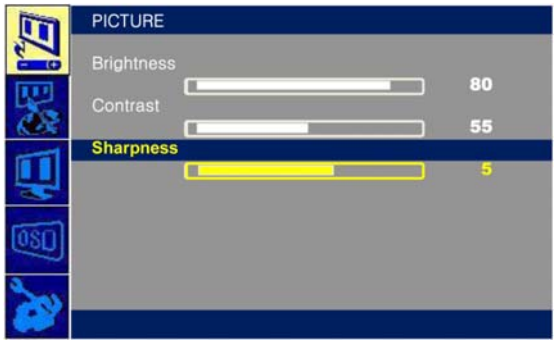
Contrast

Selecting the Contrast option increases or decreases the strength (lightness or dimness) of the image. Settings are saved automatically.



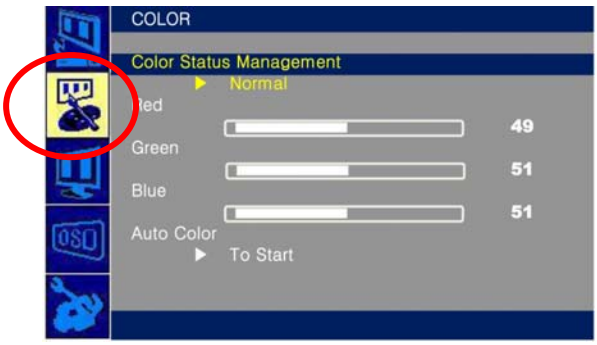
Sharpness

Adjusts the video quality to be sharp or blurry (special for text mode). Settings are saved automatically.



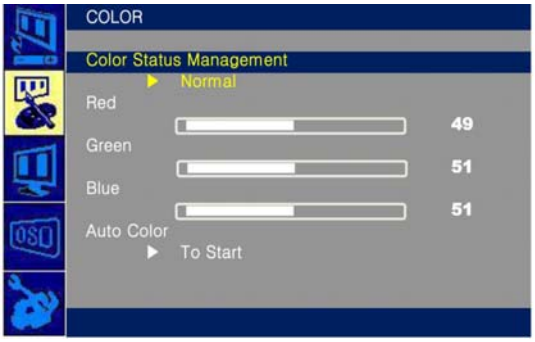
Color Menu

Includes choices for Color Status Management, User Defined Color choices and Auto Color.



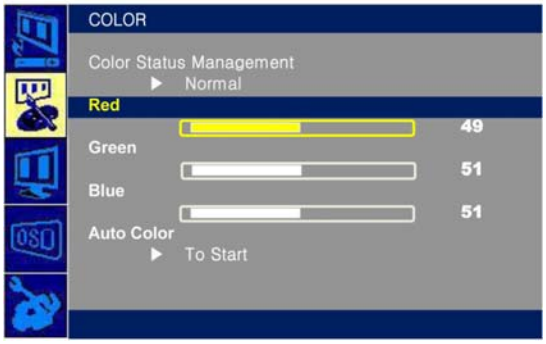
Color Status Management

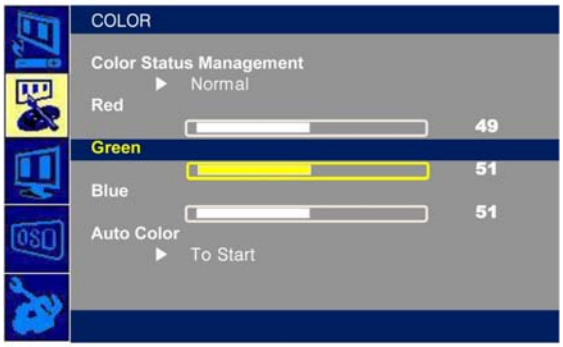
Includes choices for Normal, Warm, User Defined, or Cool color settings. Settings are saved automatically.

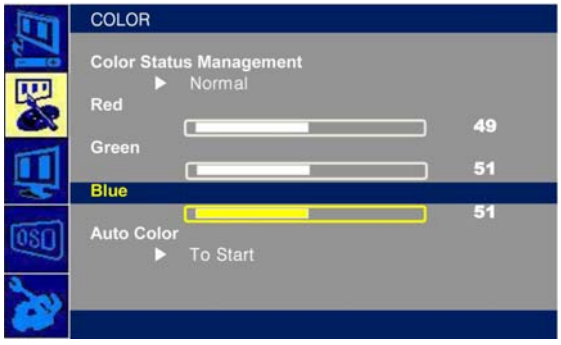


User Defined Settings

Adjust the Red, Green and Blue channels to your preference. Settings are saved automatically.

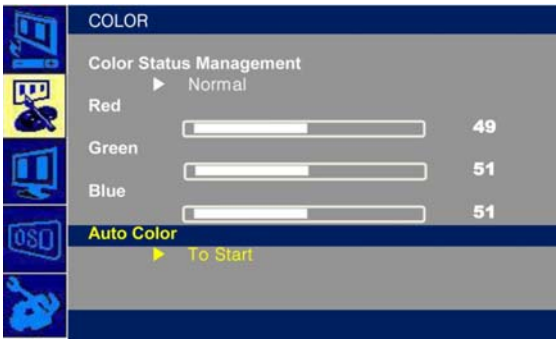






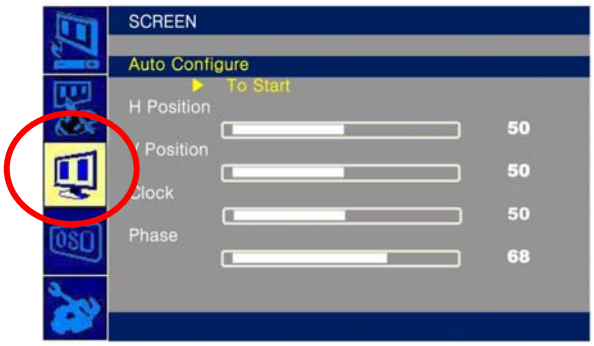
Auto Color

Adjusts color temperature automatically. Settings are saved automatically.



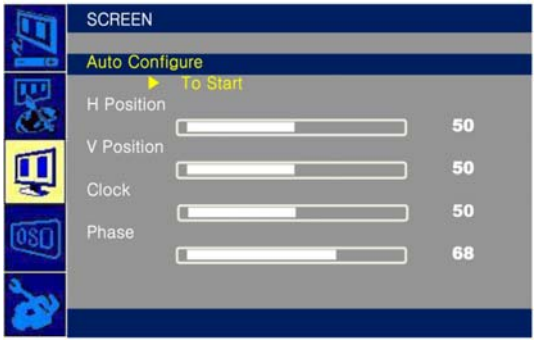
Screen/Display Menu

Includes choices for Auto Configure, Horizontal Position, Vertical Position, Clock and Phase.



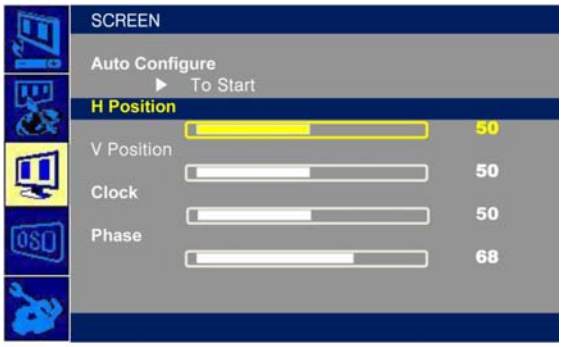
Auto Configure

Performs automatic configuration of the Clock, Phase, Vertical and Horizontal positions. If you do an Auto Configure, the display will try to find the best setting. If you are not satisfied with the auto adjustment, fine-tune the settings manually as described below. Settings are saved automatically.



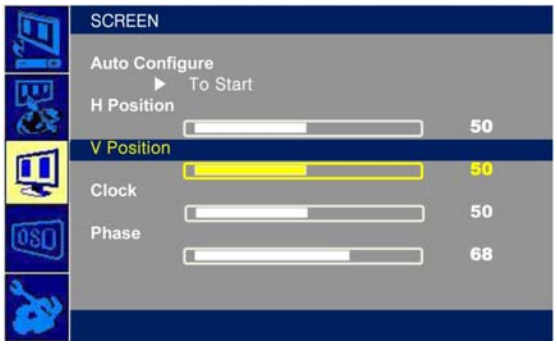
H Position (Horizontal Position)

Moves image horizontally on screen either left or right. Settings are saved automatically.



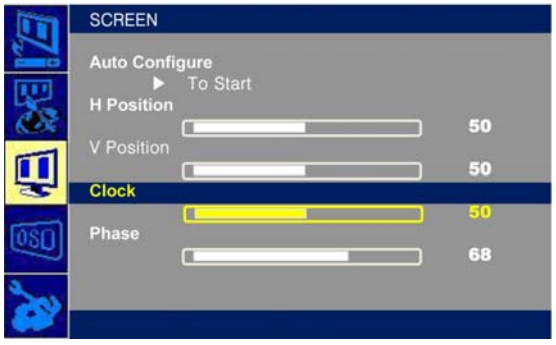
V Position (Vertical Position)

Moves images vertically on screen either up or down. Settings are saved automatically.



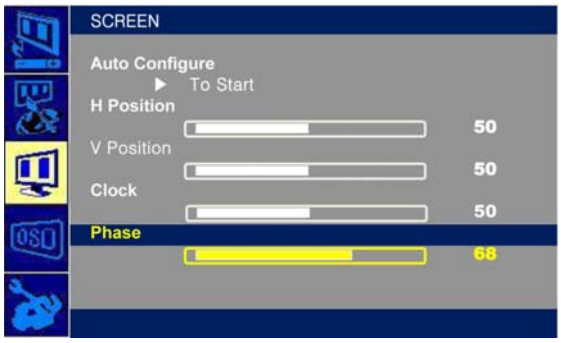
Clock

If the clock setting is not fine-tuned, you may observe periodic vertical bars of video noise on your image. These bars of noise are usually adjusted out when an Auto Adjust is performed. If the bars of noise are still present, this setting can be adjusted manually. Settings are saved automatically.



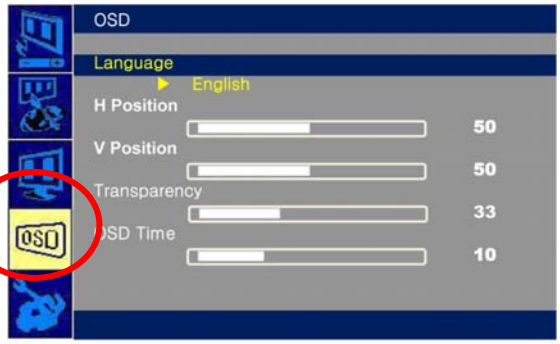
Phase

Adjust this setting so that either the vertical bars of video noise are replaced by an even amount of noise across the whole screen, or the noise disappears completely. Settings are saved automatically.



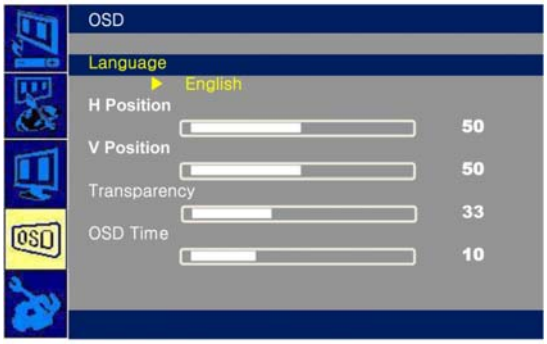
OSD Menu

Includes choices for Language, OSD Horizontal position, OSD Vertical Position, Transparency and OSD Timer.



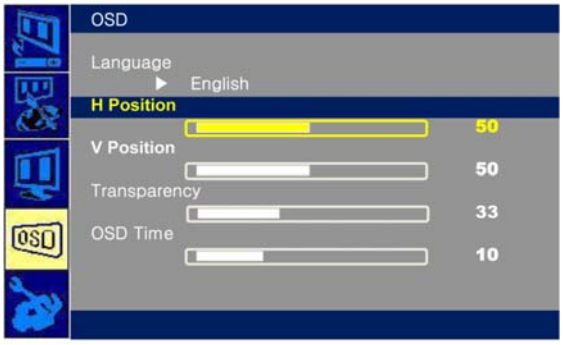
Language

Sets the language for the OSD -- the choices are English, French, German, Italian, Spanish, and Chinese. Settings are saved automatically.



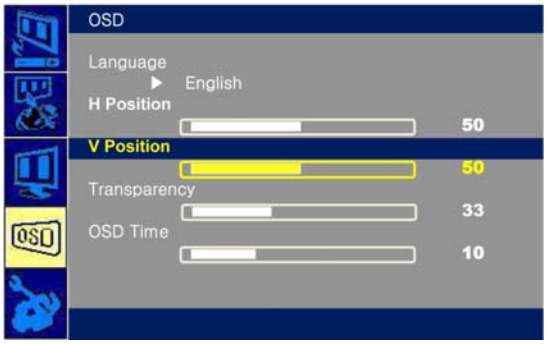
OSD H Position

Adjusts the horizontal placement of the OSD display on your screen. Settings are saved automatically.



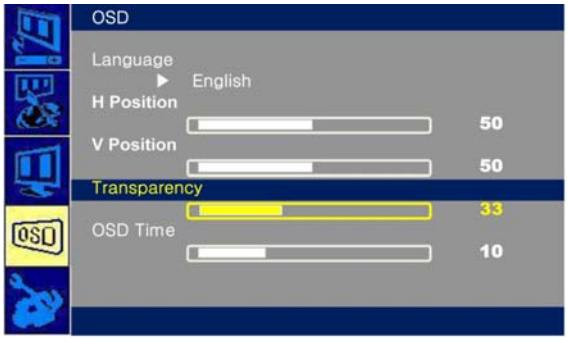
OSD V Position

Adjusts the vertical placement of the OSD display on your screen. Settings are saved automatically.



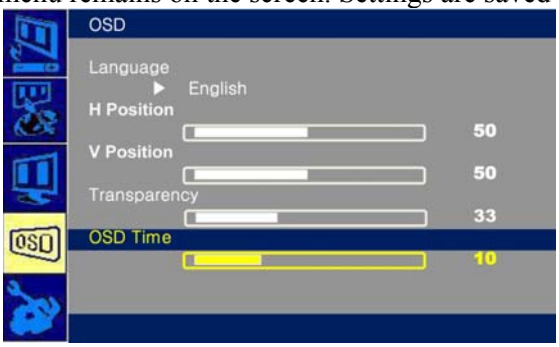
Transparency

Adjusts the transparency of the OSD screen on your display. Settings are saved automatically.



OSD Timer

Adjust how long the menu remains on the screen. Settings are saved automatically.



Setup Menu

Includes choices for Input Source, Aspect Ratio, Factory Reset, and DCR.

Source

Source sets the input mode for the display either RGB, DVI, or HGMI

Aspect Ratio

Set the preferred aspect ratio for your display -- either 16:10 or 4:3

Factory Reset

Resets the control functions back to the original factory preset values. Settings are saved automatically.

DCR (Dynamic Contrast Ratio)

Turn the Dynamic Contrast Ratio on or off.

CHAPTER 2

Enabling Your Multi-Touch Chassis Display

Windows® 7 USB Compatibility

3M Multi-Touch technology works seamlessly with the Windows® 7 operating system. The Multi-Touch display supports USB HID for direct communication. The Multi-Touch Chassis Display leverages all the multi-touch functionality that is native to Windows® 7. Plug the display into a system running Windows® 7 and you'll quickly enter the world of true multi-touch functionality.

The Multi-Touch Chassis Display is compatible with Windows® 7 with no additional software. Refer to Microsoft's Windows® 7 documentation for additional information.

All Other Platforms

When using a Windows® 7 serial connection or for Windows® XP, Vista or Linux operating systems (either USB or serial), 3M provides MicroTouch™ MT 7 Software for multi-touch drivers. This guide includes information for writing your own drivers to interface with the 3M Multi-Touch Technology.

Multi-Touch Application Support

Remember not all applications are multi-touch ready – Multi-touch behavior is a function of YOUR application. Check with your application vendor to determine if your software has multi-touch capability.

Installing 3M™ MicroTouch™ Software

Remember that Windows® 7 does not require any additional software to enable multi-touch functionality.

However, for Windows® XP, Vista or Linux® operating systems, 3M™ MicroTouch™ Software enables your Multi-Touch Chassis Display to work with your computer. 3M™ MicroTouch™ Software includes a control panel for setting your touch sensor preferences and a diagnostic utility. If you are experiencing problems with the touch sensor, you can use the diagnostic utilities provided to test the system.

For more information on installing this software and using the control panel, refer to the 3M™ MicroTouch™ Software User Guide on the accompanying CD or on the corporate website at www.3m.com/touch.

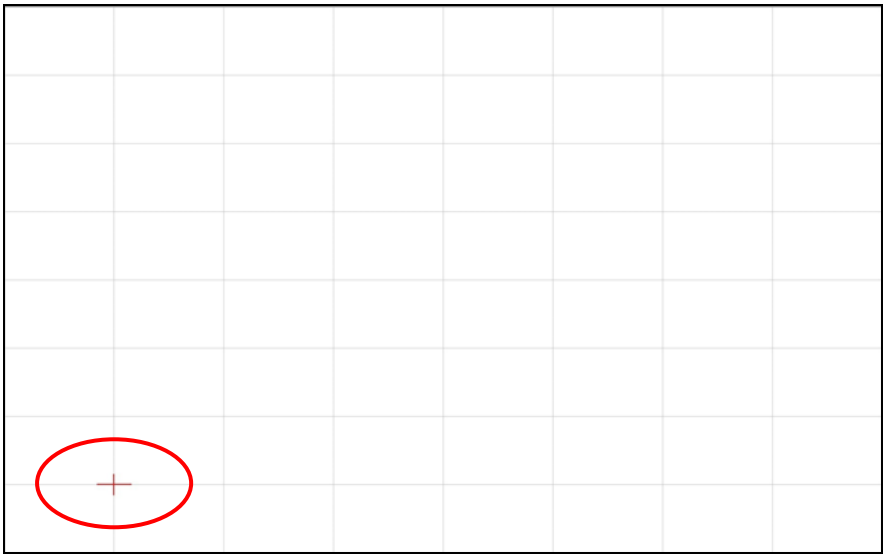
Video Alignment

The Multi-Touch Chassis has been calibrated prior to shipment and the display as delivered does not require video alignment. You should be able to accurately touch icons on the sensor. If for some reason, you cannot do this, the touch sensor's active area may not be aligned to the underlying video.

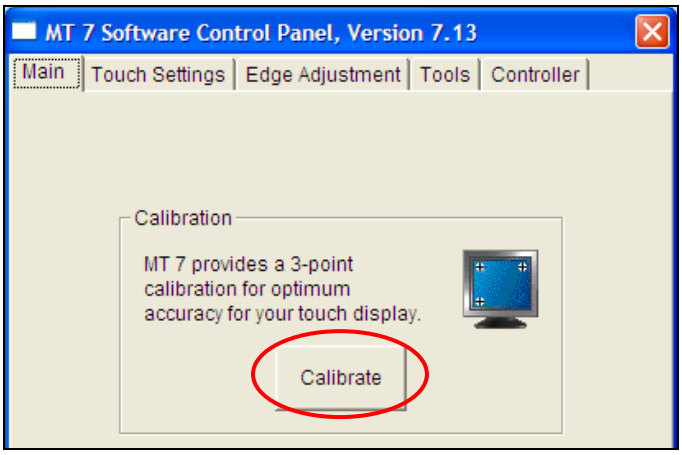
Regardless of the operating system, after you connect your touch display:

- If you are using Windows® 7, you may calibrate by accessing the Software Diagnostic Utility (SDU) found on the enclosed CD.

  Launch the SDU from the CD. Select the Tools menu and highlight Calibration. The screen below appears and you should touch the 2 targets as they appear. Press Escape to cancel Calibration.



- If you are using 3M™ MicroTouch™ MT 7 Software, launch the MT 7 Control Panel and follow the instructions on the Main tab. You'll be asked to touch 3 targets.



- If you are writing your own drivers, you should provide your own video alignment tool.

Use the Paint program (Start→ Programs→ Accessories→ Paint) to determine if you have multi-touch operation. Retest the accuracy after you perform a calibration.

APPENDIX A

3M™ PX USB Controller Communications

This appendix is intended for software developers only and discusses the fundamentals of communicating with the 3M™ PX controller. The firmware commands, which are usually issued by a driver or utility program on the host system, control the operation of the controller. This appendix lists the recommended firmware commands and describes how to use each of these commands.

Overview of USB Firmware Communications

Developers may use this information when writing touch applications, developing custom drivers or touch configurations, or testing their touch systems. Developers can issue commands to initialize the controller, select operating modes, and execute diagnostic functions.

Note: This document assumes you are familiar with USB standards and modes of communication with USB devices, as well as firmware commands and how to use them. Executing some commands may alter the performance of your sensor and render it inoperable. You should be aware of the results before executing any firmware commands.

To optimize the performance of the PX controller and simplify the development of custom drivers, 3M Touch Systems recommends you use the commands listed in this appendix for current development.

Communication Basics

This section provides information on sending firmware commands to the controller and interpreting the responses that the controller returns. The default operation of the PX controller is USB Rev 2.0 full speed.

The USB command set is implemented by using vendor requests and vendor reports, i.e., vendor specific transactions. The controller issues some reports without prompting the computer. The computer can also send requests to the controller to change how it operates or receives information about the controller. The controller issues a synchronous report in response to some of these requests.

You need to know product ID (0506H) and the vendor ID (0596H) to write your own driver. These values are required for identifying the controller.

Receiving Reports from the Controller

The controller sends a variety of reports to the computer. The first byte of each report is the Report ID that defines the structure and content of the report. The controller sends some reports as a direct response to a computer request (synchronous). The controller will also send some reports as the result of an external event, such as a touch (asynchronous).

Command Set

The USB command set is implemented by using HID Get Feature and Set Feature commands. The various requests and reports are grouped together by report size under a common feature ID.

The following table summarizes the available HID class requests.

Table 1. HID Class Requests Summary

HID Report	Command Name	bmRequest Type	bRequest	Feature Report ID	Report Subtype	Data Stage Bytes
Get Feature	GetStatus	0xA1 (D2H)	0x01	0x06	--	8
Set Feature	Calibrate	0x21 (H2D)	0x09	0x03	4	8
Set Feature	Reset	0x21 (H2D)	0x09	0x03	7	8
Set Feature	Restore Defaults	0x21 (H2D)	0x09	0x03	8	8
Get Feature	GetMaxCount	0xA1 (D2H)	0x01	0x12	--	2

Set Feature - Calibration

This is a command to do a Calibrate Extended style calibration. The controller will auto-orient on this 2 point calibration.

Table 2. Calibration Setup Stage

Offset	Field	Size	Value	Description
0	bmRequestType	1	0x21	Class,H2D,Interface
1	bRequest	1	0x09	Set Report
2	wValue	2	0x0303	Msb 03 = Feature Lsb 03 = Feature Report ID
4	wIndex	2	0	Always 0
6	wLength	2	8	Always 8

Table 3. Data Stage

Offset	Field	Size	Value	Description
0	Report ID	1	0x03	Feature report ID
1	Report Subtype	1	0x04	Indicates a calibration request
2	bCalType	1	0x01	0x01 = Extended cal (CX)
3--7	Not used	5	0	Not used

The device stalls endpoint 0 if the command cannot be processed successfully. The request cannot be processed if an invalid calibration type is given in the wValue field. The request will also fail if the 2 calibration points do not fall within certain bounds established by the firmware. These bounds require that the 2 calibration points be in opposite quadrants of the sensor.

The host should issue a GetStatus request to determine the status of this request. The status report includes a command status byte which will be set as shown below.

Table 4. Calibration Response

Command Status Byte	Description
0	Calibration Failed
1	Controller is waiting for a touch in the lower left corner. Calibration software paints a target in the lower left corner.
2	Controller is waiting for a touch in the upper right corner. Calibration software paints a target in the upper right corner.
3	Calibration completed successfully.

The controller does not timeout waiting for touch. Use the Soft Reset command to abort the calibration.

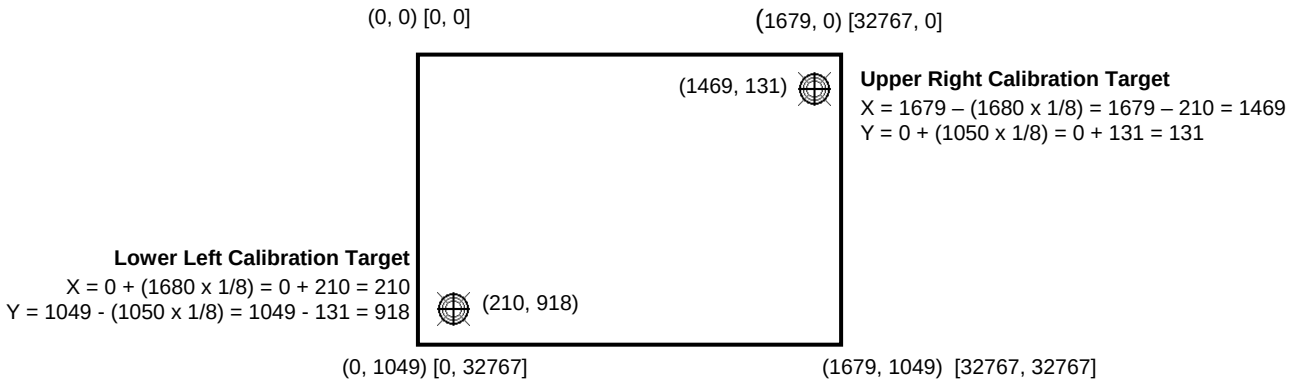
Determining Target Areas

The default calibration targets (points) are located 12.5% (1/8) inward from the corners of the video image. For example, suppose the resolution of your Windows-based display is 1680 x 1050. The Calibrate Extended command calculates the amount to move inward as follows:

- Amount to move inward in the X direction: 1680 x 1/8 = 210
- Amount to move inward in the Y direction: 1050 x 1/8 = 131

The Calibrate Extended command then positions the first calibration target inward from the lower left corner (0,1049) and the second calibration target inward from the upper right corner (1679,0). The following illustration shows how the calibration targets are calculated for a Windows-based system. Your operating system may be different.

The illustration below shows the coordinates of the calibration targets and display corners. The corners show the video coordinates in parentheses and the touch screen coordinates in brackets.



Note: Other screen resolutions will scale proportionally. The touch coordinates will not change.

Get Feature - GetStatus

This is a request to send information that indicates the status of the controller. Among the uses for this request are determining whether there were any power on check errors and determining whether the last request was completed successfully.

Table 5. Controller Status Setup Stage

Offset	Field	Size	Value	Description
0	bmRequestType	1	0xA1	Class,D2H,Interface
1	bRequest	1	0x01	Get Report
2	wValue	2	0x0306	msb=03=Feature lsb=06= Feature Report ID
4	wIndex	2	0	Always 0
6	wLength	2	8	Always 8

Table 6. Controller Status Data Stage (controller response)

Offset	Field	Size	Value	Description
0	Report ID	1	0x06	Feature Report ID
1	POC Status	1	0xXX	Power On Check Status
2	Cmd Status	1	0xXX	Status of last command
3	Touch Status	1	0	Not used
4	Async Reports	1	0xXX	0x00 = async touch output off 0x01 = async touch output on
5-7	Not used	3	0	Not used

POC Status – The status of the Power-on Checks. Various controller systems are checked at power-up. If any failures in these systems are detected, a POC flag is set. The POC status field reports the state of these flags.

Table 7. Power On Check Bit Fields

Bit Number	Description	Notes
0	Not used	
1	ROM_ERROR	Code area checksum error
2	PWM Error	Touch screen not connected or potential problem
3	NOV_ERROR	Parameter blocks checksum error
4	HDW_ERROR	Problem with ADCs
5--7	Not used	

Command Status – The status for the last command request. This field is used to determine whether the last request was processed successfully. It is also used to track the progress of a multi-stage request, such as 2 point calibration. The Status Request does not affect the contents of this field, i.e., successful or unsuccessful processing of a previous status request does not cause the command status field to be updated.

Table 8. Valid Command Status Field Entries

Response	Description
0	Failure in command processing
1	Command being processed
2	Stage 1 processing complete (for multi-stage commands)
3	Command complete
4	Soft Reset Occurred
5	Hard Reset Occurred
6 -- 7	Not used

Get Feature - GetMaxCount

This is a request to send information that indicates the maximum number of simultaneous touches supported by the controller.

Table 9. Setup Stage

Offset	Field	Size	Value	Description
0	bmRequestType	1	0xA1	Class,D2H,Interface
1	bRequest	1	0x01	Get Report
2	wValue	2	0x0312	msb=03=Feature lsb=12 Feature Report ID
4	wIndex	2	0	Always 0
6	wLength	2	2	Always 2

Table 10. Data Stage (controller response)

Offset	Field	Size	Value	Description
0	Report ID	1	0x12	Feature Report ID
1	Max Count	1	0x1E	Number of actual fingers supported

Note: The number of actual contacts reported may exceed this number.

Set Feature - Reset

This is a request to perform a controller reset. Soft resets are automatic after any block parameter changes.

Table 11. Reset - Setup Stage

Offset	Field	Size	Value	Description
0	bmRequestType	1	0x21	Class,H2D,Interface
1	bRequest	1	0x09	Set Report
2	wValue	2	0x0303	msb=03=Feature lsb=03= Feature Report ID
4	wIndex	2	0	Always 0
6	wLength	2	8	Always 8

Table 12. Reset – Data Stage

Offset	Field	Size	Value	Description
0	Report ID	1	0x03	Feature Report ID
1	Report Subtype	1	0x07	Indicates a reset request
2	bResetType	1	0x01 0x02	Soft Reset Hard Reset
3--7		5	0	Not used

A Hard Reset will cause the controller to re-enumerate.

In the case of a Soft Reset, after sending the command, the controller will acknowledge (ACK) the transfer, but the command will not yet be completed. Before sending any other commands, the host should poll with GetStatus until the command status field returns "Soft Reset Occurred," "Command Complete," or "Fail". Any timeout for this status polling should be 2 seconds minimum.

Set Feature –Restore Defaults

This is a request to restore parameter defaults.

Table 13. Restore Defaults -- Setup Stage

Offset	Field	Size	Value	Description
0	bmRequestType	1	0x21	Class,H2D,Interface
1	bRequest	1	0x09	Set Report
2	wValue	2	0x0303	msb=03=Feature lsb=03= Feature Report ID
4	wIndex	2	0	Always 0
6	wLength	2	8	Always 8

Table 14. Restore Defaults - Data Stage

Offset	Field	Size	Value	Description
0	Report ID	1	0x03	Feature Report ID
1	Report Subtype	1	0x08	Restore Defaults
2-7		6	0	Not used

After sending this command, the controller will acknowledge (ACK) the transfer, but the command will not yet be completed. Before sending any other commands, the host should poll with GetStatus until the command status field returns “Command Complete” or “Fail”. Any timeout for this status polling should be 2 seconds minimum.

Asynchronous Reports

Coordinate Data – Multi-Touch Digitizer mode Async Report 0x13

This is used to transfer the coordinate data to the host. This report, when activated, is sent to the host whenever new data is available or scheduled for transmission. It is an asynchronous report that is activated by default at power up.

The report shown supports up to 6 simultaneous touches. Note that if more than 6 touches were to be supported, Report 0x13 would be sent as many times as necessary to accommodate the number of fingers touching. Only the first Report 0x13 will have a non-zero actual count. Each valid touch is marked with an ID number that remains the same from touchdown through liftoff. The ID number can be any value from 0 to 255. Ignore all other data within a touch report structure with a status marked “not valid”.

The coordinate system is Upper Left origin.

Table 15. Coordinate Data Report 0x13 --Data Stage

Offset	Field	Size	Value	Description
0	Report ID	1	0x13	Report ID
1	Touch Report	10	See table 16	Touch Report Structure
11	Touch Report	10	See table 16	Touch Report Structure
21	Touch Report	10	See table 16	Touch Report Structure
31	Touch Report	10	See table 16	Touch Report Structure
41	Touch Report	10	See table 16	Touch Report Structure
51	Touch Report	10	See table 16	Touch Report Structure
61	Actual Count	1	1 to 60	Number of valid touch reports
62	Not used	1	0	
63	Not used	1	0	

Table 16. Touch Report Structure

Offset	Field	Size	Value	Description
0	Status	6	0xXX	0x00 Report not valid 0x04 Not touching 0x07 Touching
1	Touch ID	1	0-255	Touch thread ID number
2	X lsb	1	0xXX	X (0-7FFF)
3	X msb	1	0xXX	
4	Y lsb	1	0xXX	Y (0-7FFF)
5	Y msb	1	0xXX	
6	Width lsb	1	0xXX	Width (0-7FFF)
7	Width msb	1	0xXX	
8	Height lsb	1	0xXX	Height (0-7FFF)
9	Height msb	1	0xXX	

APPENDIX B

3M™ PX Serial Controller Communications

This appendix is intended for software developers only and discusses the fundamentals of communicating with the 3M™ PX serial controller. The firmware commands, which are usually issued by a driver or utility program on the host system, control the operation of the controller; however developers can enter these commands directly. This appendix:

- Describes the controller default settings.
- Lists the recommended firmware commands for current development.
- Describes how to use each of these commands.
- References additional commands developers may need to use.

The description of each command includes the command syntax, the default value, how the command works, and the expected response from the controller.

Overview of Firmware Commands

Developers may use these commands when writing touch applications, developing custom drivers or touch configurations, or testing their touch systems. Developers can issue commands to initialize the controller, select operating modes, and execute diagnostic functions.

Note: This document assumes you are familiar with standards and modes of communication with serial devices, as well as firmware commands and how to use them. Executing some commands may alter the performance of your sensor and render it inoperable. You should be aware of the results before executing any firmware commands.

To optimize the performance of the 3M™ PX controller and simplify the development of custom drivers, 3M Touch Systems recommends you use the commands listed in this appendix for current development.

Controller Default Settings

Communication Parameters

The operation of the PX serial controllers is N81 (no parity, 8 data bits, and 1 stop bits) at 115,200 baud (nonadjustable).

Data Format

Data format refers to the type of packet the controller uses to send the X/Y touch coordinates to the host system. Format Tablet Multi-Touch is the default format for the 3M™ PX serial controller. In Format Tablet Multi-Touch, the controller sends 6 bytes per point and provides the most rapid response time to a touch.

Note that 3M MicroTouch Software automatically sets communications parameters to N81.

The format is a six byte packet that includes one status byte, four bytes of binary X,Y position data and a touch ID. The X,Y coordinates are 14 bits, providing a range of 0 to 16,383. The data is sent in the following format:

Table 17. Touch Data Format Settings

Data Sequence	Bits							
	7	***6***	***5***	***4***	***3***	***2***	***1***	***0***
Status - Byte 1	1	P[1]	0	0	0	0	0	0
X - Byte 2	0	X6	X5	X4	X3	X2	X1	X0
X - Byte 3	0	X13	X12	X11	X10	X9	X8	X7
Y - Byte 4	0	Y6	Y5	Y4	Y3	Y2	Y1	Y0
Y - Byte 5	0	Y13	Y12	Y11	Y10	Y9	Y8	Y7
ID – Byte 6	0	N6	N5	N4	N3	N2	N1	N0

Note 1: P is the proximity bit. It is set to 1 when there is a touch, 0 for a liftoff.

The ID is associated with a touch stream from one finger. The ID, in the range of 0-127, is assigned on a rotating basis at touchdown. A finger touch stream consists of a touchdown, maybe some continuing touch points, ending with a liftoff. The ID is released on liftoff, and becomes available to be reassigned.

When multiple fingers are down, the packets from the touch streams are sent interleaved. There is no order imposed on the interleave.

Operating Mode

The *operating mode* specifies the conditions under which the controller sends the X/Y touch coordinates (input data packet) to the host system.

Mode Stream is the default operating mode for the 3M™ PX serial controller. In Mode Stream, the controller sends a continuous stream of data packets when the sensor is touched. The controller sends the data as long as a touch continues on the sensor.

Because Mode Stream sends touch data continually, it is the most versatile mode, and it provides the best response time and overall feel.

3M Touch Systems recommends that the touch driver generate an interrupt as each packet in the data stream arrives. Because touchdown and liftoff events are specially coded, your software can generate mouse events that correspond to what the user is doing. This enables instant feedback and prevents data loss.

Communicating with the Controller

This section provides information on sending firmware commands to the controller and interpreting the responses that the controller returns.

The commands listed in Table 18 are those that 3M Touch Systems currently uses for development. 3M Touch Systems recommends that you use only these commands for 3M™ PX serial controller development.

Commands to the controller are sent on the signal **Receive Data** (RXD) line as a serial data stream. For each command it receives, the controller sends a response to the host on the signal **Transmit Data** (TXD) line also as a serial data stream.

Sending Commands to the Controller

When you send a command to the controller, you must use the correct command format. The general format of a command is as follows:

<Header>Command<Terminator>

Note: The following descriptions of header, command, and terminator, use 3M Touch Systems terminal emulator key sequences. You may need to enter the sequence in a different format, depending on your emulator.

The *header* is the first character in the command string and is the ASCII start-of-header control character SOH. The hexadecimal code for the ASCII SOH control character is 01. To start the command sequence, use the key combination Ctrl A (^A). If you are working with an IBM PC compatible system, the Ctrl A key combination immediately returns an ASCII ☺ character.

The *command*, which always follows the header, consists of ASCII uppercase letters and numbers only (printable characters).

The *terminator* is the last character of each command string and is an ASCII carriage return CR. An ASCII CR control character is 0D hexadecimal. To enter a carriage return, ending the command sequence, use Enter or the key combination Ctrl M (^M).

This appendix lists each command as a string of ASCII control characters and printable characters consisting of a header, the command, and a terminator as follows:

<SOH>*Command*<CR>

Receiving Responses from the Controller

After executing a command, the controller returns a response or acknowledgment to the host system. Each controller response consists of a header, the command response, and a terminator in the following format:

<Header>Command Response<Terminator>

Note: The following descriptions of header, response, and terminator, use 3M Touch Systems terminal emulator key sequences. The format of controller responses varies depending on the terminal emulation mode you are using.

The *header* is the first character in the response string and is the ASCII start-of-header control character SOH. The hexadecimal code for the ASCII SOH control character is 01. If you are working with an IBM PC compatible system in terminal mode, the SOH control character returns a ☺ character to the sensor.

The *command response*, which always follows the header, is a range of ASCII characters depending on the type of command sent. Responses can be in many forms. For example, one standard response is **0** (ASCII character 'zero' or 30 hexadecimal). This response indicates a successful command completion for most commands, while it indicates a failed completion for other commands. Refer to the firmware command section for a description of what the response indicates for *each* particular command.

Another standard response is **1** (ASCII character 'one' or 31 hexadecimal). In most cases, this response indicates the command failed. The controller received an invalid command that it could not execute.

Some possible reasons for a command failure include:

- The command was not formatted correctly.
- The system parameters were not set up to allow command execution.
- The controller does not support the command.

The *terminator* is the last character of each response string and is an ASCII carriage return CR. The hexadecimal code for the ASCII CR control character is 0D hexadecimal. The value returned in the response will be the ASCII control character for a carriage return, displayed on the screen as the cursor moving to the next line.

In this appendix, responses are shown as a string of ASCII characters consisting of a header, the response, and a terminator as follows:
<SOH>*Response*<CR>

Controller Initialization

To initialize the 3M™ PX serial controller for new development, 3M Touch Systems recommends that the host system issue a Reset command whenever the host system is powered on and is attempting to establish communication with the controller.

Firmware Commands

Developers may use this information when writing touch applications, developing custom drivers or touch configurations, or testing their touch systems. Developers can use firmware commands to initialize the controller, select operating modes, specify data formats, and execute diagnostic functions.

Caution: This document assumes you are familiar with firmware commands and how to use them. Executing some commands may alter the performance of your touch system and render it inoperable. You should be aware of the results before executing any firmware commands.

To optimize the performance of the touch controller and simplify the development of custom drivers, 3M Touch Systems recommends you use the commands listed in Table 18 for current development. Using these commands ensures compatibility with all 3M™ controllers.

Note: When you enter commands in terminal mode, precede each command with <CTRL> A to enter the start of header.

Table 18. Firmware Commands for PX Serial Controller Development

Command	Code	Description
Calibrate	CX	Initiates an interactive 2-point calibration.
Get Copyright	Q101	Returns the copyright string.
Mode Down Up	MDU	Reports touchdowns and liftoffs only.
Mode Inactive	MI	Turns off touch reports.
Mode Stream	MS	Default mode. Streaming touch reports.
Name Command	NM	Returns a controller identifier string.
Null Command	Z	Returns an ACK. No effect.
Output Identity	OI	Returns Identity string: ADxxxx
Soft Reset	R	Resets certain modes and gets a new baseline.
Restore Defaults	RD	Restores default settings.
Unit Type	UT	Returns the Status string: AD****ss.

Calibrate

Syntax: <SOH>**CX**<CR>

Response: <SOH>**1**<CR> Valid point response.

A Valid Point Response ('1') signifies that a touch coordinate was detected and is in range of the expected screen target area. Two valid point responses indicate successful calibration.

<SOH>**0**<CR> Invalid point response
An Invalid Point Response ('0') is returned if the touch coordinate is out of range. If either calibration point is invalid, the touch coordinates are discarded and the calibration points remain unchanged from their previous values.

<SOH>**2**<CR> Invalid point response
An Invalid Point Response ('2') is returned if the user did not touch the target long enough to provide an accurate point.

Description: Initiates an interactive 2-point calibration.

During the calibration process, you define the active area of the touch sensor by mapping locations to an absolute X/Y coordinate system. You touch two *target areas* on the sensor. Touching the target areas sends the X/Y coordinates for those touch points to the controller. The controller calculates all other touch points based on these two points.

The Calibrate command sets the calibration targets (points) 12½ percent inward from the corner of the video image. Setting the targets inward makes the calibration process easier and more accurate.

It also establishes screen orientation.

Calibrate Procedure

To use the CX command:

1. Enter the Calibrate (CX) command. The controller sends an initial acknowledgment of <SOH>0<CR>.
2. Touch the sensor at a lower left target, which is located 12.5% (1/8) in from the corner of the video image. The controller returns an acknowledgment of <SOH>1<CR>. This is a positive response. If you receive a negative response <SOH>0<CR>, you can cancel the calibration by issuing a Reset command and then start over again.
3. Touch the sensor at an upper right target, which is located 12.5% (1/8) in from the corner of the video image. The controller returns an acknowledgment of <SOH>1<CR>. This is a positive response. If you receive a negative response, you must start over again.

Touching the two valid calibration points results in a successful calibration. If either calibration point is invalid, the calibration fails. The PX controller restores the previous calibration values. If Calibrate fails, repeat the CX process.

Guidelines for Calibrate Command

Here are several guidelines for using the Calibrate commands:

- The controller uses the data immediately before liftoff to register a calibration touch. Therefore, you can touch the coordinate target, hold for a few seconds, and then lift off. Instructing users to touch this way results in a more accurate calibration.
- The controller stores the data in non-volatile memory (NOVRAM). Therefore, you do not have to calibrate the sensor each time you power on the system. You should, however, recalibrate the touch sensor any time the video display changes size or resolution.
- You can cancel calibration at any time during this sequence by issuing a Reset command.

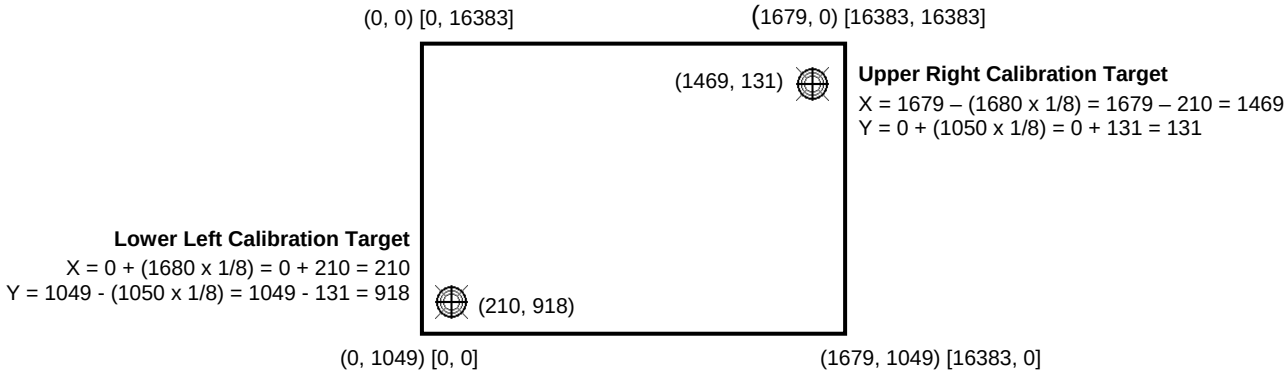
Determining Target Areas

The default calibration targets (points) are located 12.5% (1/8) inward from the corners of the video image. For example, the resolution of your Windows-based display is 1680 x 1050. The Calibrate Extended command calculates the amount to move inward as follows:

- Amount to move inward in the X direction: 1680 x 1/8 = 210
- Amount to move inward in the Y direction: 1050 x 1/8 = 131

The Calibrate Extended command then positions the first calibration target inward from the lower left corner (0,1049) and the second calibration target inward from the upper right corner (1679,0). The following illustration shows how the calibration targets are calculated for a Windows-based system. Your operating system may be different.

The illustration below shows the coordinates of the calibration targets and display corners. The corners show the video coordinates in parentheses and the touch screen coordinates in brackets. Note that the touch screen coordinates for the serial interface have their origin in the lower-left corner.



Note: Other screen resolutions will scale proportionally. The touch coordinates will not change.

Get Copyright

Syntax: <SOH>**Q101**<CR>

Response: <SOH>**Copyright © 2011 3M. All rights reserved.**<CR>

Description: This command is used to get copyright information.

Mode Down Up

Syntax: <SOH>**MDU<**CR>

Response: <SOH>**0**<CR> Positive response.

Description: Limits touch reports to touchdown and liftoff events only.

Mode Inactive

Syntax: <SOH>**MI**<CR>

Response: <SOH>**0**<CR> Positive response.

Description: Turns off touch reports.

Mode Stream

Syntax: <SOH>**MS**<CR>

Response: <SOH>**0**<CR> Positive response.

The controller will respond with acknowledge (ACK) for compatibility. This format is the only format supported by this controller.

Description: This is the default mode of operation at power up. Touch reports include touchdown and liftoff events as well as continuing touches.

Name Command

Syntax: <SOH>**NM**<CR>

Response: <SOH>**0**<CR> Positive response.

Description: Returns a name string

Null Command

Syntax: <SOH>**Z**<CR>

Response: <SOH>**0**<CR> Positive response.

Description: Queries the controller and waits for a response.

Use Z to determine that you are communicating with the controller or to make sure that a utility is communicating with the controller. Using this command does not affect the controller's current operating parameters.

Output Identity

Syntax: <SOH>**OI**<CR>

Response: <SOH>ADXxxx<CR>

where:

AD = Two ASCII characters that describe the type of 3M Touch Systems controller.
Xxxx = This is a unique identifier not necessarily the actual firmware revision number.

Description: Returns a 6-character identifier, which describes the controller type and the firmware version number.

3M Touch Systems recommends that the host system issue a Reset command whenever the host system is powered on and is attempting to establish communication with the controller.

The amount of time needed to execute a Reset command is typically 500 milliseconds with a defined maximum of 2000 milliseconds. Therefore, the application program should wait and be sure it receives the command response before issuing another command to the controller following the reset.

Restore Defaults

Syntax: <SOH>**RD**<CR>

Response: <SOH>**0**<CR> Positive response.

Description: Returns to the factory default operating parameters. The Restore Defaults command copies the 3M Touch Systems factory default parameters from ROM to the non-volatile memory (NOVRAM) and then executes a Reset command.

The following table lists the factory defaults for the PX controller. The Restore Defaults command is useful in situations where inadvertent commands to the controller have rendered the sensor inoperative.

Table 19. PX Factory Default Settings

Operating Parameter	Default
Baud Rate	115,200
Serial Communication Settings	N, 8, 1
Data Format	Format Tablet Multi-Touch
Operating Mode	Mode Stream
Return to Factory Calibration	Yes

Note: After you issue a Restore Defaults command, you must recalibrate your sensor.

Soft Reset

Syntax: <SOH>**R**<CR>

Response: <SOH>**0**<CR> Positive response.

Description: Initializes the hardware and the firmware, causes the controller to stop sending data, and recalculates the environmental conditions (for example, stray and offset values). The Reset command also cancels the Calibrate command and returns the controller to normal operation.

Unit Type

<SOH>**UT**<CR>

Responds with an 8-character identity string. This string identifies the type of controller currently attached to the system, lists the features supported by the controller, and outputs the status of the controller hardware (a self-test code).

Returns an identification code up to 8 ASCII characters in the following format:

<SOH>***TtFfffSs***<CR>

where:

Tt = Two ASCII characters that identify the controller type.
AD Indicates the PX series of controllers

Ffff = Four ASCII characters that indicate the features supported by the controller.

******** Indicates no additional features configured

Ss = Two ASCII characters that provide status information about the controller hardware. The two characters represent one byte. Each character is in the range 0 to 9 and A to F.

Table 2 defines the meaning of each bit in the status byte. Each bit can be set to 1 or 0, where **1** = an error and **0** = no error. So a response of:

00 = No diagnostic errors (normal response)

The PX running with no errors returns the following string:

<SOH> **AD****00** <CR>

The format includes two bitmapped ASCII hex status bytes. A “00” indicates no errors.

Table 20. Bit Meanings in Status Byte

Bit	Description	Notes
0	Not used	

1	ROM_ERROR	Code area checksum error
2	PWM Error	Touch screen not connected or potential problem.
3	NOV_ERROR	Parameter Block1 checksum error
4	HDW_ERROR	Problem with ADCs
5	Not used	
6	Not used	
7	Not used	

APPENDIX C

Troubleshooting & Maintenance

If you have a problem setting up or using your display, you may be able to solve it yourself. Before calling 3M Touch Systems, try the suggested actions that are appropriate to the problems you are experiencing with the display. You may also want to consult your video card user's manual for additional troubleshooting advice.

Display Installation Problems

Table 21. Common Display Installation Issues

Issue	Solution
No image displayed (blank screen)	**Is the display receiving power?** • Check that the computer's power cable is connected properly and securely into a grounded electrical outlet. • Check that the AC input jack is firmly plugged into the display. • Check that the display's power cable is connected properly and securely to an electrical outlet. • Try using a different power cable. • Try using a different electrical outlet.
No image displayed (blank screen)	**Is the display receiving a valid video signal from the PC?** • Check that the computer is powered on. • Check that the video cable is connected properly and securely to the display and the computer. • Check that the LED on the rear of the unit is green. • Check that no pins are bent in the video cable connector. • Check that the video card is firmly seated in the card slot in your computer.

Issue	Solution
	• Check that the video input from the video card falls within the refresh rate of the display. Refer to *Supported Video Display Modes and Refresh Rates* in Chapter 1. • Check that your computer is using a supported display mode. Refer to *Supported Video Display Modes and Refresh Rates* in Chapter 1.
No image displayed (blank screen)	**Is the display in Power Management mode?** • If the LED on the rear of the display is flashing amber, touch the screen, press any key on the keyboard, or move the mouse to restore operation.
No image displayed (blank screen)	**Are the brightness and contrast settings too low?** • Use the display controls to adjust these values.
Abnormal image	• Check that the video input from the video card falls within the refresh rate of the display. Refer to *Supported Video Display Modes and Refresh Rates* in Chapter 1. • Check that the video cable is connected properly and securely to the display and the computer.
Colors of image are abnormal	• Check that the video cable is connected properly and securely to the display and the computer. • Check that no pins are bent in the video cable connector.
Disturbances on the screen	• The video display adjustments are incorrect. Refer to Chapter 2 for adjusting procedures.

Troubleshooting the Touch Sensor

If you are experiencing problems with the touch sensor, check the following list of common installation errors.

Table 22. Common Touch Sensor Installation Issues

Common Installation Issues	Possible Solutions
Touch sensor does not respond to touch	• Review the installation procedures. Are all cables connected properly? • After you installed Touch Software, did you restart your PC to activate the touch sensor driver? • Remove the sensor communications cable and plug it back in. • Disconnect the power cable and plug it back in.
Touch sensor is not accurate	• Calibrate the touch sensor for the current video resolution and operating system. Refer to the Video Alignment section in Chapter 3 for additional information.

Common Installation Issues	Possible Solutions
Cursor does not follow finger movement or does not reach the edges of the sensor	• Calibrate the touch sensor for the current video resolution and operating system. Refer to the Video Alignment section in Chapter 3 for additional information.
Cursor is not located directly underneath your finger	• Open the touch sensor control panel and make sure all cursor offsets (vertical, edge/horizontal) are turned off. • Calibrate the touch sensor for the current video resolution and operating system.

Power Management

The Multi-Touch Chassis Display conforms to the Video Electronics Standards Association (VESA) Display Power Management Signaling (DPMS) standard. To benefit from power management, the display must be used in conjunction with a computer and video card that implements the VESA DPMS standard.

The PC automatically invokes the power management feature if you do not use the touch sensor, mouse, or keyboard for a user-defined period. To restore the video image, simply touch the sensor, press a key, or move the mouse. To set the period of time after which the PC will invoke the power management feature, refer to the user manual that came with your video card or PC. The touch sensor will remain on throughout this sequence.

APPENDIX D

Regulatory Information

Regulatory Agency Approvals

Your product complies with the following regulatory standards:

- FCC-B
- CE
- UL60950/IEC60950/EN60950 certified in compliance with the CB test scheme
- RoHS/WEEE directives

This equipment has been tested and found to comply within limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Move the equipment away from the receiver.
- Consult the dealer or an experienced radio/television technician for additional suggestions.

Note: You are cautioned that any change or modification to the equipment not expressly approved by the party responsible for compliance could void your warranty.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

This device complies with Part 15 of the FCC rules: Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Warning

To assure continued FCC compliance, the user must use the supplied grounded power supply cord and the provided shielded video interface cable with bonded ferrite cores. Also, any unauthorized changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this device.

3M Touch Systems is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment.

CE Conformity for Europe

The device complies with the requirements of the ECC directive 2004/108/EC with regard to "Electromagnetic compatibility" and 2006/95/EC with regard to "Safety".